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# CONTACTING THE FARM OPERATOR BY TELEPHONE: A RE-EXAMINATION

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### Abstract

This paper examines data from the April 1986 Grain Stocks Surveys in California, Georgia and Nebraska, conducted with CATI, in an attempt to study optimal timing of telephone contacts. The evening hours after 7 p.m. are optimal from the perspective of highest operator contact rate. The paper also studies optimal timing for the return call when a previous call resulted in a busy or no answer outcome. Data indicates considerable variation from State to State in the optimal timing for returning calls and no global recommendation can be made.

Keywords: CATI timing, Number of attempts, Callback timing

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\* This paper was prepared for limited distribution to the research \*  
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## Summary

Many things affect the response rate and the quality of data collected over the telephone. Data collected for the 1986 Grain Stock Survey in California, Georgia and Nebraska with CATI was analyzed for trends due to timing of the contact attempt, number of attempts made, and the respondent.

The evening hours after 7 p.m. appears to be the best time to make a successful contact, particularly with a farm operator. In California, there is some indication that success can be achieved earlier, and this is likely due in part to the larger number of farm operations with a managerial setup as compared to the owner operator operations which are more common in Georgia and Nebraska. Additional analysis of the calls which immediately follow a call which resulted in a busy or a no-answer outcome gives some insight into the timing of followup calls. The data suggest that following a busy signal, a followup call should be made between 15 and 60 minutes later. Calls returned in less than 15 minutes have almost a 50% chance of resulting in another busy signal as their outcome. Following a no-answer response, followup calls should be made no sooner than 45 minutes later. More precise recommendations are quite variable by State.

Some caution should be used in generalizing results obtained from this study since samples were specifically selected to contain small grain operators. Also, the data analyzed represents only three States (California, Georgia and Nebraska) in 1 month (April 1986), and for one survey (Grain Stocks). Some differences are noted between results of this study and an earlier study (Warde, 1986b) on the California Acreage and Production Survey of November, 1985, which was also restricted to small grain operators.

## CONTACTING THE FARM OPERATOR BY TELEPHONE: A RE-EXAMINATION

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### Introduction

This paper examines the effects of the timing of telephone calls in order to achieve a maximum response rate by the farm operator in surveys conducted by the National Agricultural Statistics Service (NASS). Previous studies by Bosecker (1977), Nealon and Dillard (1984), and Warde (1986a, 1986b) indicate that responses which are obtained from the spouse of the farm operator tend to be different from those obtained directly from the farm operator. Warde (1986a) suggests that changes in the timing of the calls and in the introductory phrases in telephone surveys may be used in order to improve the response rate by farm operators and decrease the response rate by their spouses.

This paper presents an analysis of data collected from the April 1986 Grain Stocks Surveys (GSS) in California, Georgia and Nebraska. The States selected for study in the GSS were chosen since that survey was conducted using Computer Assisted Telephone Interviewing (CATI) procedures and hence provided an extensive data base. The study was designed in such a manner that the first attempts made to contact each operation were assigned at random across the usual calling period for the State in question. Warde (1986b) provides an analysis of the Fall Acreage and Production (A&P) Survey in California, which was also conducted using CATI, and comparisons will be made to this study.

### Analysis of April GSS data.

Table 1 shows the response rates and distributions for the April GSS in the three States for the three classes of respondent. It can be seen from table 1 that Nebraska had the lowest overall response rate (69.38 percent) and that the response rate by the spouse of the farm operator for that State was the largest amongst the three States analysed (7.13 percent). These differences are not statistically different from those in California and Georgia, but they do warrant further investigation since they imply a tendency to substitute data obtained from the spouse for data obtained from the operator whenever overall response rates are low. Several studies (Bosecker, 1977; Warde, 1986a) have shown that this is a potential source of bias in NASS surveys.

Table 1. Count and completion rates for April GSS by type of respondent.

Respondent Type	State					
	California		Georgia		Nebraska	
#	%	#	%	#	%	
Operator	358	79.56	545	64.57	749	67.60
Spouse	30	6.67	54	6.40	79	7.13
Other	62	13.78	245	29.03	280	25.27
Total	450	100.00	844	100.00	1,108	100.00
Selected	605	74.38	1,206	69.98	1,597	69.38

Tables 2 and 3 show the distribution of responses for the April GSS by the hour at which the contact was attempted. Table 2 shows that in California there was a higher rate of attempted calls between 4 and 7 p.m. as compared to other times of the day while in Georgia and Nebraska the highest rate of attempted calls is between 6 and 8 p.m. Nebraska has a second peak in the number of attempted calls between 9 and 10 p.m. It should be noted that this distribution is mainly a function of the staffing patterns exercised at the various SSO's, and these staffing patterns reflect the historic outcome of calls made at that time in that State.

Table 3 shows that the completion rates for all three States improves quite noticeably after 7 p.m. This contrasts with the after 6 p.m. improvement noted in California in the November A&P survey which was reported in Warde (1986b). Since it is likely that completed calls will require more time to deal with than calls resulting in most other outcomes and hence fewer completed calls can be made within a one hour period, these two tables can jointly be interpreted as indicating that the optimal time at which to attempt a call is after 7 p.m. in all three of the States studied.

Table 2. Distribution of calls attempted for April GSS by hour of contact.

Hour	State					
	California		Georgia		Nebraska	
	#	%	#	%	#	%*
7- 8	1	0.1	5	0.1	20	0.6
8- 9	3	.2	39	1.1	72	2.0
9-10	3	.2	31	.9	25	.7
10-11	4	.3	51	1.5	11	.3
11-12	0	0	36	1.0	1	-
12- 1	0	0	53	1.5	27	.8
1- 2	4	.3	51	1.5	68	1.9
2- 3	20	1.2	37	1.1	12	.3
3- 4	265	16.3	422	12.1	1	-
4- 5	303	18.7	366	10.5	15	.4
5- 6	314	19.4	186	5.3	301	8.3
6- 7	295	18.2	738	21.1	814	22.6
7- 8	246	15.2	713	20.4	710	19.7
8- 9	165	10.2	527	15.1	503	13.9
9-10			237	6.8	735	20.4
10-11					294	8.2
Total	1,623	100.0	3,492	100.0	3,609	100.0

- Indicates a value of less than .05 percent.

\* Note that since Nebraska spans two time zones, Central and Mountain, the hour of contact for the analysis has been adjusted to be the local time for the farm operator at the time that a contact was attempted rather than the CATI log time in Lincoln where the call was initiated.

Table 3. Count and response rates for April GSS by hour of contact for completed calls.

Hour	State					
	California		Georgia		Nebraska	
#	%*	#	%*	#	%*	
7- 8	0	0	1	20.0	12	60.0
8- 9	1	33.3	10	25.6	38	52.8
9-10	0	0	9	29.0	13	52.0
10-11	3	75.0	7	13.7	4	36.4
11-12			8	22.2	0	0
12- 1			11	20.8	6	22.2
1- 2	2	50.0	17	33.3	22	32.4
2- 3	4	20.0	9	24.3	6	50.0
3- 4	72	27.2	56	13.3	1	100.0
4- 5	67	22.1	37	10.1	3	20.0
5- 6	69	22.0	23	12.4	56	18.6
6- 7	87	29.5	153	20.7	146	17.9
7- 8	87	35.4	233	32.7	215	30.3
8- 9	58	35.2	183	34.7	183	36.4
9-10			87	36.7	283	38.5
10-11					120	40.8
Total	450	27.7	844	24.2	1,108	30.7

\* Note that since Nebraska spans two time zones, Central and Mountain, the hour of contact for the analysis has been adjusted to be the local time for the farm operator at the time that a contact was attempted rather than the CATI log time in Lincoln where the call was initiated.

% Note that the percentage in table 3 is the percent of calls made at this time which were completed, and is computed as the count (#) in table 3 divided by the corresponding count (#) from table 2.

It can be seen from table 4 that the outcome of a call varies with the number of attempts made to contact the operation. As the number of attempts made increases, so does the percentage of those attempts which result in a no answer outcome. There is no clear trend for busy and refusal outcomes, but the percentage of outcomes coded as callback tends to decrease as the number of attempts made increases. The percentage of calls which result in a completion peaks with the second or third attempt and then declines over further attempts. This trend is documented in the literature (see, for example, Kish, 1965) and is usually attributed to the use of information obtained from calls coded as callbacks on the first call to greatly improve the chance of a successful contact being made on the second or third attempts.

Table 4. Count and response rates for April GSS by number of attempts made to contact and outcome.

Number of Attempts	California											
	Complete		Callback		Busy		No answer		Other*		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
1	174	28.8	147	24.3	38	6.3	193	31.9	53	8.7	605	100.0
2	149	35.9	82	19.8	26	6.3	125	30.1	33	8.0	415	100.0
3	63	26.7	37	15.7	19	8.1	99	42.0	18	7.7	236	100.0
4	37	24.8	22	14.8	11	7.4	70	47.0	9	6.0	149	100.0
5	12	13.5	12	13.5	5	5.6	51	57.3	9	10.1	89	100.0
6	7	14.0	5	10.0	7	14.0	27	54.0	4	8.0	50	100.0
7	3	10.0	1	3.3	4	13.3	19	63.3	2	6.6	30	100.0
> 7	5	10.2	2	4.1	1	2.0	37	75.5	4	8.2	49	100.0
Total	450	27.7	308	19.0	111	6.8	621	38.3	133	8.2	1,623	100.0

  

Number of Attempts	Georgia											
	Complete		Callback		Busy		No answer		Other*		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
1	271	22.4	318	26.3	96	7.9	385	31.8	141	34.5	1,211	100.0
2	225	27.0	187	22.5	70	8.4	290	34.8	61	7.3	833	100.0
3	146	25.7	112	19.7	52	9.2	212	37.3	46	8.1	568	100.0
4	95	25.5	63	16.9	39	10.5	138	37.0	38	10.2	373	100.0
5	51	22.4	37	16.2	21	9.2	102	44.7	17	7.5	228	100.0
6	24	18.2	23	17.4	12	9.1	66	50.0	7	5.3	132	100.0
7	15	18.8	8	10.0	10	12.5	45	56.3	2	2.5	80	100.0
> 7	17	22.1	12	15.6	6	7.8	40	51.9	2	2.6	77	100.0
Total	844	24.1	760	21.7	306	8.7	1,278	36.5	314	9.0	3,502	100.0

  

Number of Attempts	Nebraska											
	Complete		Callback		Busy		No answer		Other*		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
1	491	30.8	363	22.7	131	8.2	410	25.7	202	12.7	1,597	100.0
2	295	31.9	209	22.6	53	5.7	263	28.4	105	11.4	925	100.0
3	172	33.4	80	15.5	39	7.6	189	36.7	35	7.9	515	100.0
4	70	25.6	38	13.9	34	12.4	111	40.5	21	7.7	274	100.0
5	46	30.5	18	11.9	11	7.3	63	41.7	13	8.6	151	100.0
6	15	20.3	16	21.6	7	9.5	33	44.6	3	4.1	74	100.0
7	11	25.6	7	16.3	1	2.3	22	51.2	2	4.6	43	100.0
> 7	8	22.2	2	5.6	5	13.9	21	58.3	0	0	36	100.0
Total	1,108	30.7	733	20.3	281	7.8	1,116	30.9	377	10.5	3,615	100.0

\* Includes responses coded as refusal, telephone problems, answering device, wrong number, no longer farming and deceased.

@ May not add to 100.0 due to rounding.

Comparison of November A&P and April GSS data for California.

Since data was available from CATI surveys conducted in California during November (A&P) and April (GSS), a comparison of the various responses between these surveys was made. Working hours for the two surveys (3 p.m. to 9 p.m.) were essentially the same, and most of the enumerators who were used in April had also been used in November, thus minimizing the impact of interviewer variability between the two surveys. It should be noted, however, that differences could still be observed for a variety of reasons, such as:

- (1) The difference in the time of year - November versus April.
- (2) The difference in the type, and hence the length of interviews, for the two surveys - A&P versus GSS.

Table 5 gives a summary of these comparisons.

Table 5. Comparison of the November A&P to the April GSS responses in California by hour of contact and outcome of call.

Hour	Busy				Call back			
	Nov A&P		Apr GSS		Nov A&P		Apr GSS	
	#	%	#	%	#	%	#	%
3- 4	78	10.2	17	5.9	185	24.3	66	22.9
4- 5	75	9.1	23	7.0	186	22.5	71	21.7
5- 6	40	5.7	16	4.8	142	20.1	60	18.0
6- 7	63	8.8	12	3.8	87	12.2	40	12.6
7- 8	85	10.7	30	11.5	105	13.2	41	15.7
8- 9	58	9.5	12	6.9	77	12.6	20	11.5

  

Hour	Complete				No answer			
	Nov A&P		Apr GSS		Nov A&P		Apr GSS	
	#	%	#	%	#	%	#	%
3- 4	157	20.6	95	33.0	288	37.8	86	29.9
4- 5	211	25.5	92	28.1	300	36.2	117	35.7
5- 6	232	32.9	88	26.4	239	33.9	143	42.9
6- 7	282	39.6	110	34.6	228	32.0	130	40.9
7- 8	292	36.7	103	39.3	249	31.3	73	27.9
8- 9	235	38.4	67	38.5	199	32.5	60	34.5

A chi-square test was conducted for four of the possible outcomes. No significant differences were observed for the outcomes busy or callback (Chi-square = 6.16, P = .291 and Chi-square = 4.01, P = .548 respectively), but for complete and no answer significant differences were observed (Chi-square = 18.26, P = .003 and Chi-square = 39.88, P = 0.0001 respectively). The other possible outcomes were not compared either due to inadequate sample sizes or due to differences in the definitions of the outcomes used for the two surveys. Thus, it appears that there is a much higher completion rate between 5 p.m. and 7 p.m.

in November as compared to that in April. This is balanced by much higher no answer rates in April versus November for these same hours. This observation is consistent with the idea that the farm operator can work in the fields later in the late Spring than in the late Fall due to there being more daylight available at that time.

It is interesting to note, however, that these results exactly contradict the only other literature which shows response rates by telephone as a function of the month of the year. Vigderhouse (1981) reports on a telephone survey conducted in Ontario and Quebec. The interview lasted 10 minutes and calls were made on weekdays only (Monday through Friday) between 9 a.m. and 9 p.m. A maximum of six callbacks was allowed. The calls were made to working listed and unlisted numbers (Vigderhouse was an employee of the Canadian Telephone Company and had access to the latter). Table 6 shows the contrast in the response rates between his survey and the two surveys being compared here.

Table 6. Comparison of the response rates for the November A&P, the April GSS and data from Vigderhouse (1981).

Time	April		November	
	GSS	Vigderhouse	A&P	Vigderhouse
3-4	33.0	46.4	20.6	34.0
4-5	28.1	44.3	25.5	39.1
5-6	26.4	43.0	32.9	30.2
6-7	34.6	51.4	39.6	41.9
7-8	39.3	45.7	36.7	32.3
8-9	38.5	45.7	38.4	32.3

A comparison of the outcome of calls as a function of the number of attempts which had been made is shown in table 7. A chi-square test was performed on four of the possible outcomes as before. There was a significant difference in the call distribution for completed calls ( $\text{Chi-square} = 15.36, P = .032$ ), calls resulting in no answer ( $\text{Chi-square} = 21.70, P = .003$ ), and calls resulting in a call back ( $\text{Chi-square} = 20.65, P = .004$ ), but no significant difference for calls which resulted in a busy signal ( $\text{Chi-square} = 11.37, P = .123$ ).

Table 7. Comparison of the November A&P to the April GSS responses by number of calls attempted and outcome of call.

Number of attempts	Busy				Call back			
	Nov	A&P	Apr	GSS	Nov	A&P	Apr	GSS
#	%	#	%	#	%	#	%	
1	644	33.5	174	28.8	414	21.6	147	24.3
2	432	35.8	149	35.9	195	16.2	82	19.8
3	237	31.7	63	26.7	145	19.4	37	15.7
4	151	31.4	37	24.8	82	17.0	22	14.8
5	64	20.8	12	13.5	60	19.5	12	13.5
6	49	21.9	7	14.0	24	10.7	5	10.0
7	28	18.4	3	10.0	21	13.8	1	3.3
> 7	37	11.3	5	10.2	29	8.8	2	4.1

  

Number of attempts	Complete				No answer			
	Nov	A&P	Apr	GSS	Nov	A&P	Apr	GSS
#	%	#	%	#	%	#	%	
1	204	10.6	38	6.3	537	28.0	193	31.9
2	105	8.7	28	6.3	394	32.7	125	30.1
3	59	7.9	19	8.1	251	33.6	99	42.0
4	56	11.6	11	7.4	163	33.9	70	47.0
5	22	7.1	5	5.6	127	41.2	51	57.3
6	19	8.5	7	14.0	110	49.1	27	54.0
7	10	6.6	4	13.3	82	53.9	19	63.3
> 7	34	10.4	1	2.0	195	59.5	37	75.5

#### Analysis of Busy Calls

Table 8 gives the results of an analysis of the results of the call attempted immediately following a call which resulted in a busy signal. These data are partitioned into six time groups, 1 to 14 minutes, 15 to 29 minutes, 30 to 44 minutes, 45 to 59 minutes, more than an hour, and then the partition of the latter into later the same day. It is clear from table 11 that following a busy signal, any call returned in less than 15 minutes has almost a 50 percent chance of resulting in another busy signal. A conclusion relating to maximizing the chance of obtaining a completion is not so clear. For all three States, a call returned sometime in the interval 15 to 59 minutes following the call which resulted in a busy signal seems to be the optimal timing, with some indication that 45 to 59 minutes later is the best. Warde (1986b) for the November Acreage and Production Survey in California found that the period 15 to 29 minutes after the initial call was optimum, with 39.3 percent of calls returned within 15 minutes resulting in another busy signal.

Table 8. Analysis of results of the call immediately following a call which resulted in a busy response.

Time between calls	California										Total*
	Busy		Callback		Complete		No answer				
	#	%	#	%	#	%	#	%			
0-14 min	13	50.0	3	11.5	7	26.9	2	7.7			26
15-29 min	2	12.5	3	18.8	7	43.8	2	12.5			16
30-44 min	0	0	1	20.0	3	60.0	1	20.0			5
45-59 min	0	0	1	20.0	4	80.0	0	0			5
> 1 hour	3	5.4	11	19.6	14	25.0	23	41.1			56
(same day)	1	4.8	2	9.5	4	19.0	10	47.6			21

Time between calls	Georgia										Total*
	Busy		Callback		Complete		No answer				
	#	%	#	%	#	%	#	%			
0-14 min	17	46.0	4	10.8	9	24.3	6	16.2			37
15-29 min	10	31.3	11	34.4	5	15.6	4	12.5			32
30-44 min	3	23.1	1	7.7	3	23.1	4	30.8			13
45-59 min	2	22.2	2	22.2	3	33.3	2	22.2			9
> 1 hour	25	12.6	41	20.6	44	22.1	76	38.2			199
(same day)	5	16.1	9	29.0	4	12.9	11	35.5			31

Time between calls	Nebraska										Total*
	Busy		Callback		Complete		No answer				
	#	%	#	%	#	%	#	%			
0-14 min	29	48.3	6	10.0	19	31.7	5	8.3			60
15-29 min	6	26.1	3	13.0	10	43.5	3	13.0			23
30-44 min	1	10.0	2	20.0	4	40.0	2	20.0			10
45-59 min	2	40.0	1	20.0	2	40.0	0	0			5
> 1 hour	9	5.0	45	25.1	50	27.9	47	26.3			179
(same day)	3	11.5	7	26.9	9	34.6	4	15.4			26

\* The four columns listed do not necessarily add to the total due to outcomes coded as no longer farming, operator deceased, telephone noise, wrong number, refusal or answering device.

### Analysis of no answer calls

Table 9 gives the results of an analysis of the results of the call attempted immediately following a call which resulted in no answer. As with the busy signal calls discussed in the previous section, these were partitioned into 15 minute periods for the first hour but were then analysed for one hour periods up to six hours after the call which resulted in no answer. The results here are unclear. In Nebraska, the optimal time to call is 45 minutes to an hour after the no answer call with 2 to 3 hours later being the second best time. In Georgia, the optimal time was 5 to 6 hours later with the second best time being 4 to 5 hours later. In California, the optimal time to call is 3 to 4 hours later with 2 to 3 hours being the second best time.

In all three States the regular calling period extends from 3 p.m. until 9 or 10 p.m. and in general calls which are made during the evening hours have a better chance of success. Calls which are initiated more than three hours after a call resulting in a no answer are likely to have been made during an evening time slot and hence the slightly better completion rates noted could be due to the time when the call was initiated rather than the time since the call which resulted in no answer. At best, these two indicators of improved completion rates are confounded.

### Conclusions and Recommendations

The analyses conducted on the April A&P data from 1986 confirm that the optimal time to make a telephone call in order to obtain a completed interview is in the evening. For these data, the optimal time is after 7 p.m. as contrasted with the study by Warde (1986b) in California which indicated reasonable contact rates after 6 p.m. This result holds for all of the States examined in the two data sets with some variation within this time period as to the best single hour in which to make the call.

Analysis to determine the optimal timing of calls following an attempt for which the outcome was a busy signal indicates that such calls should be initiated between 15 minutes and 1 hour later. The optimal interval within this 45 minute period varied from State to State and is inconclusive due to the small number of calls made during these time periods on which the conclusions are based.

Analysis to determine the optimal timing of calls following an attempt which resulted in a no answer is not consistent from State to State and no general recommendations can be made. It is recommended that further data be studied on this topic in an attempt to resolve the difficulty.

Table 9. Analysis of results of the call immediately following a call which resulted in a no answer response.

Time between calls	California										Total*
	Busy		Callback		Complete		No answer				
	#	%	#	%	#	%	#	%			
0-14 min	11	5.1	32	15.0	48	22.4	117	54.7		214	
15-29 min	1	3.2	2	6.5	3	9.7	24	77.4		31	
30-44 min	4	5.7	7	10.0	5	7.1	52	74.3		70	
45-59 min	3	6.8	4	9.1	4	9.1	30	68.2		44	
1-2 hours	6	4.4	12	8.7	23	16.7	95	68.8		138	
2-3 hours	2	5.9	4	11.8	8	23.5	18	52.9		34	
3-4 hours	2	11.8	1	5.9	8	47.1	5	29.4		17	
4-5 hours	0	0	0	0	1	16.7	5	83.3		6	
5-6 hours	0	0	1	50.0	0	0	0	0		2	
> 6 hours	0	0	0	0	0	0	0	0		0	

  

Time between calls	Georgia										Total*
	Busy		Callback		Complete		No answer				
	#	%	#	%	#	%	#	%			
0-14 min	4	4.6	9	10.5	12	14.0	58	67.4		86	
15-29 min	4	4.2	11	11.5	16	16.7	62	64.6		96	
30-44 min	4	5.6	11	15.3	8	11.1	47	65.3		72	
45-59 min	2	4.0	7	14.0	5	10.0	34	68.0		50	
1-2 hours	11	7.1	26	16.9	27	17.5	80	52.0		154	
2-3 hours	5	6.1	16	19.5	20	24.4	36	43.9		82	
3-4 hours	2	2.9	13	18.6	16	22.9	33	47.1		70	
4-5 hours	2	6.1	7	21.2	11	33.3	11	33.3		33	
5-6 hours	2	14.3	1	7.1	6	42.9	5	35.7		14	
> 6 hours	37	7.5	101	20.4	77	15.6	249	50.4		494	

  

Time between calls	Nebraska										Total*
	Busy		Callback		Complete		No answer				
	#	%	#	%	#	%	#	%			
0-14 min	11	5.1	31	14.2	32	14.7	131	60.1		218	
15-29 min	1	1.6	8	12.5	18	28.1	32	50.0		64	
20-44 min	5	7.4	16	23.5	11	16.2	33	48.5		68	
45-59 min	1	2.9	4	11.4	13	37.1	15	42.9		35	
1-2 hours	5	4.1	20	16.5	28	23.1	58	47.9		121	
2-3 hours	7	7.2	13	13.4	29	29.9	40	41.2		97	
3-4 hours	3	5.8	5	9.6	14	28.9	27	51.9		52	
4-5 hours	1	5.6	2	11.1	3	16.7	11	61.1		18	
5-6 hours	0	0	2	25.0	2	25.0	3	37.5		8	
> 6 hours	11	2.6	72	16.7	41	9.5	160	37.1		431	

\* The four columns listed do not necessarily add to the total due to outcomes coded as no longer farming, operator deceased, telephone noise, wrong number, refusal or answering device.

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